Prediction of duck nest survival in conventional and zero-tilled stubble fields

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Abstract
Survival of duck nests in stubble fields under conventional tillage as well as zero-tilled was predicted by comparing the chronology of stubble cultivation, spring seeding, and nest initiation dates. The probability of a conventional stubble field remaining free of cultivation long enough for a clutch to hatch was only 0.5 for the earliest nests, and was almost negligible for a majority of nests. Early nests in zero-tilled fields probably would be destroyed by the seeding operations, but nesting should compensate for some of these losses. After early May, increasingly more fields would be seeded and thus would provide safer nesting sites. The overall success of duck nests would be higher in zero-tilled fields than in stubble fields that are annually cultivated.

Introduction
The importance of prairie Canada for the production of waterfowl, particularly ducks, is well known (Munro and Gollop 1985, Pospahala et al. 1974). Over half the ducks taken by North American hunters are produced in this region, mainly on private farmlands. However, in recent years there has been a growing concern over the loss of this waterfowl habitat through intensive farming. Both wetland and upland habitats are involved. Cultivation of upland has left little habitat suitable for wildlife on many farmlands and the trend is continuing (Sugden and Beyersbergen 1984).

Intensive farming reduces the upland cover preferred by nesting ducks, nests in cropped fields are vulnerable to farming activities and those in remnants of native cover are subject to high predation losses (Duebert and Kuntrud 1974, Higgins 1977, Krapu 1977). Early-nesting species such as Pintails (Anas acuta) that depend on residual vegetation from the previous year are affected most.

All possible strategies that may help to offset these impacts should be considered by waterfowl managers (Zittlau 1979). One strategy is the use of alternative farming methods that improve nesting success for ducks without imposing a liability upon the farmer, such as zero-tilled (Higgins 1977, Cowan 1982, Rodgers 1983). Although the practice of zero-tilled is in its infancy on the Canadian prairies, it is increasing and there is a growing interest as its advantages in soil and energy conservation become more apparent (Saskatchewan Tillage Committee 1981). Thus, it would be useful to know its potential for influencing duck production should the trend continue. In this paper we compare the probable survival rates of duck nests in stubble fields with and without zero-tilled farming.

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Results
Nest study
We found 208 duck nests in upland cover on the research area in 1980, and 61 in 1981. None was found in stubble fields. The comparatively low number in 1981 was attributed to drought conditions and deteriorated habitat in that year. During our search of the 10 private farmland blocks in 1981, we found 19 nests: 17 Mallard (Anas platyrhynchos), one Pintail, and one Shoveler (A. clypeata). Stubble fields on these blocks yielded only one Mallard nest.

We were able to estimate initiation dates for 189 nests in 1980 and 50 in 1981 (Fig. 1). Because there was only one search on the private farmland blocks, we have not included data from those areas. The earliest nests were initiated about mid-April by Mallards and Pintails. The overall pattern among species was similar to the one depicted by Hochbaum (1944:94). However, on our area, Mallards and perhaps Pintails had a second peak that differed little from
Autumn, were designated for in seeding dates between conventional and zero­
till fields. Heavy snowfall in the previous winter may delay seeding into stubble fields for a few days because of
moisture conditions. Conversely, in dry springs, less moisture
in zero-tilled fields allows earlier seeding. Nests initiated before seeding was underway would have but
slight chance of survival (Fig. 5). However, those started in
a field after it was seeded would escape that operation,
though later they may be exposed to the mechanics of herb­
cide spraying. Using the 1981 seeding data (which we con­
sider most representative), we predict that nests started after
15 May would have better than a 50% chance of being in
a “safe” field, with the odds increasing as planting
dates in the following spring.

Discussion
By comparing the chronology of various farming activities
with nest initiation and hatching dates, we can predict some effects of these activities on the overall success
of nests in cropland. During our 2-year study, approximately
35% of the fields were summerfallowed, so the balance represented potential stubble cover for nesting ducks.
However, some of these were lost to fall cultivation, and
approximately 43% of the fields were unculivated stubble in
the following spring.

Despite the late tillage of some stubble (Fig. 2), few fields
would benefit stubble-nesting ducks. The probability of a stubble field remaining untilled long enough for a clutch to
hatch (assuming a 35-day exposure period) was never
greater than 0.5 after mid-April (Fig. 4). By late April it was
only 0.2, and by mid-May less than 0.1 of the few remaining
stubble fields would have proved safe for a nest initiated
then. Because most nests are started after April (Fig. 1),
it is apparent that cultivated stubble fields could not be
considered useful nesting habitat.

Our findings reaffirm the results of previous studies in
which direct measurements could be made of nest success in
cultivated fields (e.g. Milonski 1958, Higgins 1977). Stubble fields under conventional cropping systems have
little to offer nesting ducks. Indeed, they are likely to re­present a “trap” most of the time and, at best, provide high­
risk sites for very early nesting ducks. The comparatively
low use of the extensive stubble fields on our study blocks
may reflect a tendency for ducks not to select nesting cover
where they have been previously unsuccessful (Hiddén
1965, Doty and Lee 1974).

Why ducks apparently made greater use of stubble in the
past despite low nest survival (e.g. Milonski 1958) is not clear.
It may have been in response to the much higher pop­
ulations then present (see Fretwell 1972 for discussion). As
well, there were probably higher proportions of young females in the nesting populations, and those may have been the birds that tended to pioneer into new habitat,
albeit of low quality.

Under a zero-tillage system, stubble fields are not culti­
vated and seeding is done directly into the stubble. Weeds
are controlled by chemicals. Overall, there is little or no dif­ference in hatching dates between conventional and zero­
tilled fields. Head south in the previous winter may delay seeding into stubble fields for a few days because of
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in zero-tilled fields allows earlier seeding. Nests initiated before seeding was underway would have but
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Figure 1

- PINTAIL
- MALLARD
- SHOVELER
- WIGEON
- G-W TEAL
- B-W TEAL
- GADWALL
- L. SCAUP

Day: 11 21 01 11 21 31 10 20 30 10
Month: 04 04 05 05 05 06 06 06 07

Figure 2
Chronology of stubble field cultivation in the St-Denis area.

- Percentage of Stubble Fields Unplanted
- Time: April, May, June

Figure 3
Chronology of seeding in the St-Denis area.

- Percentage of Grain Fields Seeded
- Time: April, May, June
Figure 4
Probability of a stubble nest surviving cultivation under conventional tillage (35-day exposure period assumed)

Figure 5
Probability of a stubble nest surviving the seeding operation under zero-tillage (seeding chronology based on 1981 data, and 35-day nest exposure assumed)